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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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| 09/653,281 | 08/31/2000 | Kevin L. Beaman | M4065.0278/P27899-0818 | 4745 |

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Thomas J D'Amico
Dickstein Shapiro Morin & Oshinsky LLP
2101 L Street NW
Washington, DC 20037-1526

| EXAMINER | |
|---|---|
| BOOTH, RICHARD A | |
| ART UNIT | PAPER NUMBER |
| 2812 | |

| SHORTENED STATUTORY PERIOD OF RESPONSE | MAIL DATE | DELIVERY MODE |
|---|---|---|
| 3 MONTHS | 03/07/2007 | PAPER |

**Please find below and/or attached an Office communication concerning this application or proceeding.**

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 09/653,281 | BEAMAN ET AL. | |
| | Examiner | Art Unit | |
| | Richard A. Booth | 2812 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *01 February 2007*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *1-3,6-14,16,18,21-29,31 and 36-45* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-3,6-14,16,18,21-29,31 and 36-45* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

## DETAILED ACTION

### *Claim Rejections - 35 USC § 103*

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-3, 6, 8-9, 11-14, 16, 18, 21, 23-24, 26-29, 31, 36, 38-39, and 41-45 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wang et al., U.S. Patent 6,376,309 in view of Hoff et al., "Atomic Oxygen and the thermal oxidation of silicon" or Ruzyllo et al., "Evaluation of Thin Oxides Grown by the Atomic Oxygen Afterglow Method".

Wang et al. shows the invention as claimed including forming a tunnel oxide 404 on a substrate 402; forming a first conductor 406 over the tunnel oxide 404; forming an insulating layer 410 over the first conductor layer, the insulating layer comprising a first oxide layer over the first conductor layer, a nitride layer over the first oxide layer, and a second oxide layer over the nitride layer, wherein the second oxide layer is formed by oxidizing said nitride layer to a thickness of fifty angstroms in a single process step (see column 3, lines 39-54); forming a second conductor layer 412 over the insulating layer after the single process step; etching at least the first conductor layer, the second conductor layer, and the insulating layer, thereby defining at least one stacked structure (see Figure 3); and forming a source region and a drain region in said substrate on an

opposite side of said stacked gate structure, which will be a necessary step of completing the memory cell.

Note, the hydrogen and oxygen present when forming the second oxide layer will react to form steam.

Wang et al. fails to show forming the second oxide layer using an oxidizing ambient in atomic oxygen at various temperatures and times.

Both Hoff et al., "Atomic Oxygen and the thermal oxidation of silicon" and Ruzyllo et al., "Evaluation of Thin Oxides Grown by the Atomic Oxygen Afterglow Method" disclose forming an oxide layer in a microwave plasma environment using an oxidizing method with atomic oxygen in a single process step (see abstracts of both methods). In view of this disclosure, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the process of Wang et al. so as to form the second oxide layer using the process taught by Hoff et al. or Ruzyllo et al. because both of these processes allow for oxide growth at low temperatures with high breakdown values. Furthermore, the process of Hoff et al. or Ruzyllo et al. also uses atomic oxygen so one would expect similar results with respect to the thickness.

With respect to the particular time and temperature of the oxidation, it would have been obvious to determine through routine experimentation the optimum time and temperature to conduct the oxidation process based upon a variety of factors including the desired thermal budget and would not lend patentability to the instant application absent the showing of unexpected results.

Concerning performing processes in the apparatus as claimed in claims 11-14 26-29, and 41-44, apparatus limitations, unless they affect the process in a manipulative sense, may have little weight in process claims. *In re Tarczy-Hornoch* 158 USPQ 141, 150 (CCPA 1968); *In re Edwards* 128 USPQ 387 (CCPA 1961); *Stalego v. Heymes* 120 USPQ 473, 478 (CCPA 1959); *Ex parte Hart* 117 USPQ 193 (PO BdPatApp 1957); *In re Freeman* 44 USPQ 116 (CCPA 1940); *In re Sweeney* 72 USPQ 501 CCPA 1947).

Furthermore, concerning claim 31, note from Huff et al. and Ruzyllo et al. that the thickness of the oxide layer can be less than twenty angstroms or within the claimed range (see last two lines of Huff et al. reference and fig. 3 of Ruzyllo et al.).

Claims 7, 10, 22, 25, 37, and 40 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wang et al., U.S. Patent 6,376,309 in view of Hoff et al., "Atomic Oxygen and the thermal oxidation of silicon" or Ruzyllo et al., "Evaluation of Thin Oxides Grown by the Atomic Oxygen Afterglow Method" as applied to claims 1-3, 6, 8-9, 11-14, 16, 18, 21, 23-24, 26-29, 31, 36, 38-39, and 41-45 above, and further in view of Neely et al., U.S. Patent 5,443,863.

Wang et al., Hoff et al., and Ruzyllo et al. are applied as above but lack anticipation of forming the second oxide layer through photoexcitation or using ozone.

Neely et al. discloses decomposing ozone by photoexcitation under the presence of microwaves in order to promote oxidation (see abstract). In view of this disclosure, it would have been obvious to one of ordinary skill in the art at the time the invention was made to form the second oxide layer in Chang et al. using the process

taught by Neely et al. because this will reduce the thermal budget of the process of Chang and reduce the chances of thermal damage.

***Response to Arguments***

Applicant's arguments filed 02/01/07 have been fully considered but they are not persuasive. In response to applicant's argument that the examiner's conclusion of obviousness is based upon improper hindsight reasoning, it must be recognized that any judgment on obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning. But so long as it takes into account only knowledge which was within the level of ordinary skill at the time the claimed invention was made, and does not include knowledge gleaned only from the applicant's disclosure, such a reconstruction is proper. See *In re McLaughlin*, 443 F.2d 1392, 170 USPQ 209 (CCPA 1971). In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

Regarding the unexpected results alleged by the applicant, attorney's arguments cannot take the place of evidence in the form of affidavits or declarations in the record. Furthermore, and as previously cited, with respect to the particular time and temperature of the oxidation, it would have been obvious to determine through routine experimentation the optimum time and temperature to conduct the oxidation process

based upon a variety of factors including the desired thermal budget and would not lend patentability to the instant application absent the showing of unexpected results.

***Conclusion***

**THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Richard A. Booth whose telephone number is (571) 272-1668. The examiner can normally be reached on Monday-Thursday from 7:30-6:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Lebentritt can be reached on (571) 272-1873. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Richard A. Booth
Primary Examiner
Art Unit 2812

February 23, 2007